Headquarters U.S. Air Force

Integrity - Service - Excellence

Reducing Air Force Acquisition Response Times: Evolutionary Acquisition and Spiral Development

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Overview

- Air Force Cycle Time Reduction Imperative
- Air Force Evolutionary Acquisition and Spiral Development Efforts
  - Implementing Evolutionary Acquisition
  - Institutionalizing Spiral Development
- Changes in Requirements Processes
- Project Initiation
  - Current Process
  - Innovation Transition Planning
  - AF WRAP
- Portfolio Management

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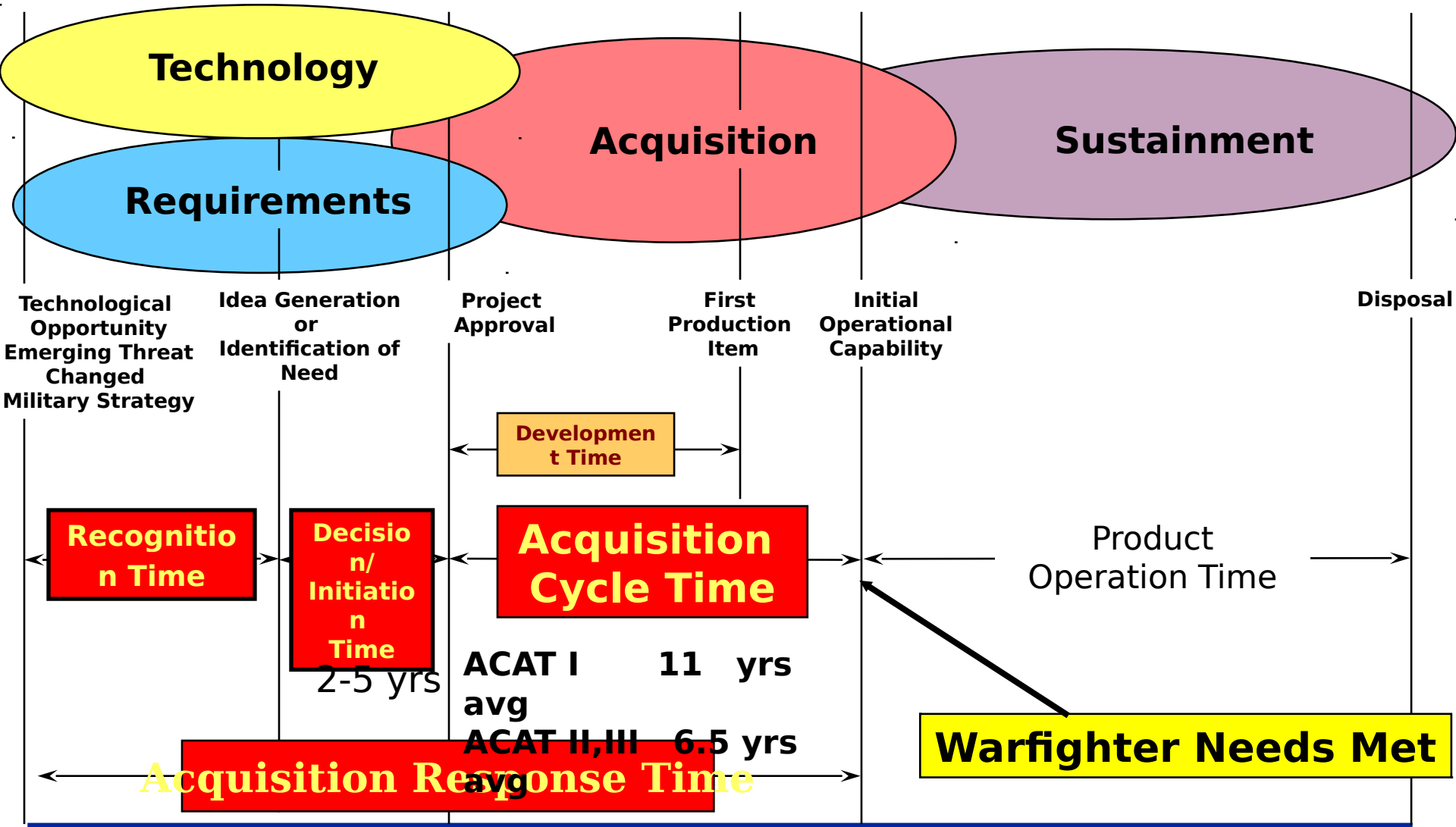
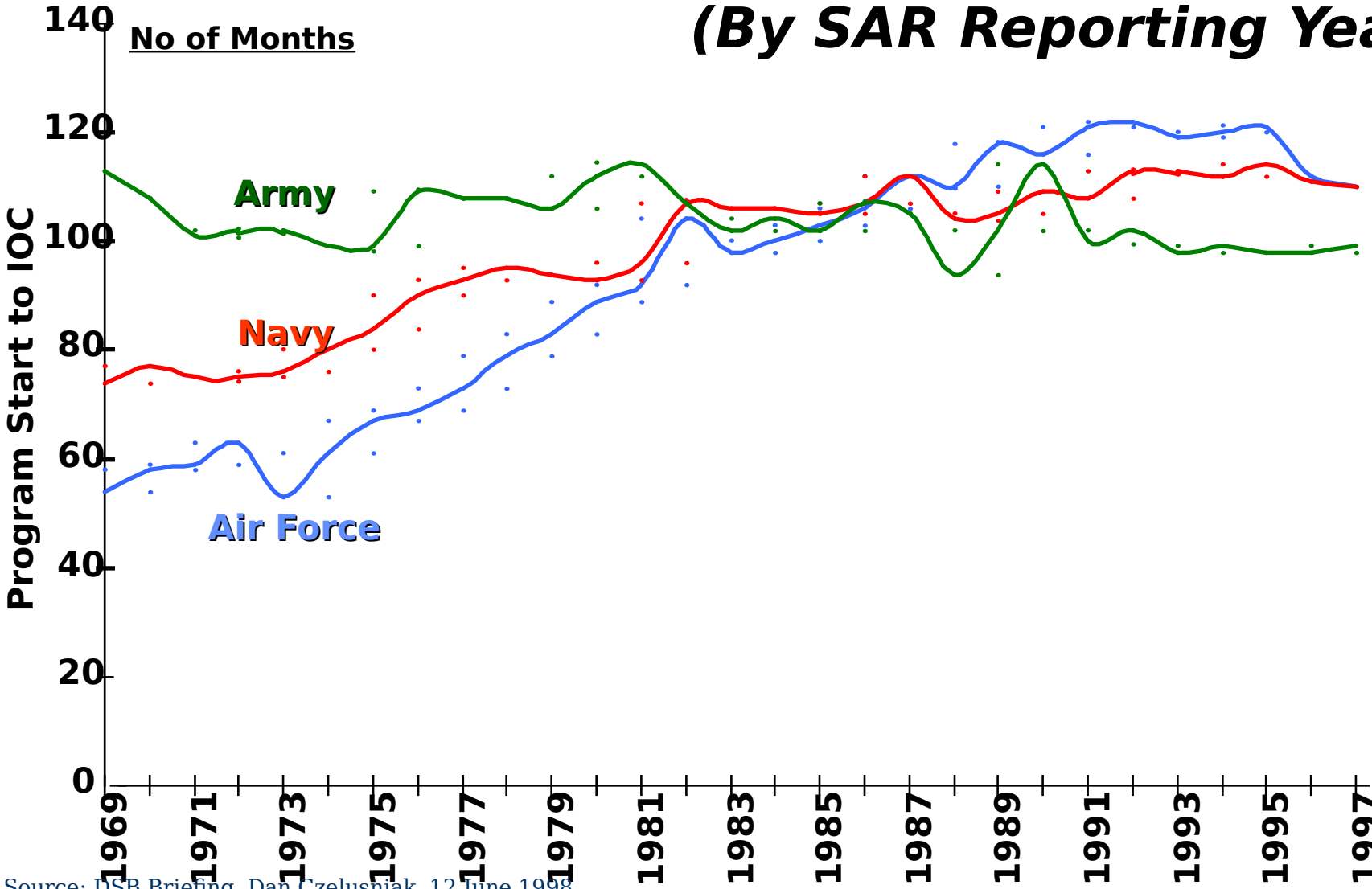
Acquisition Response Time



Acquisition Response Time

Average Acquisition Cycle Times (By SAR Reporting Years)



Source: DSB Briefing, Dan Czelusniak, 12 June 1998

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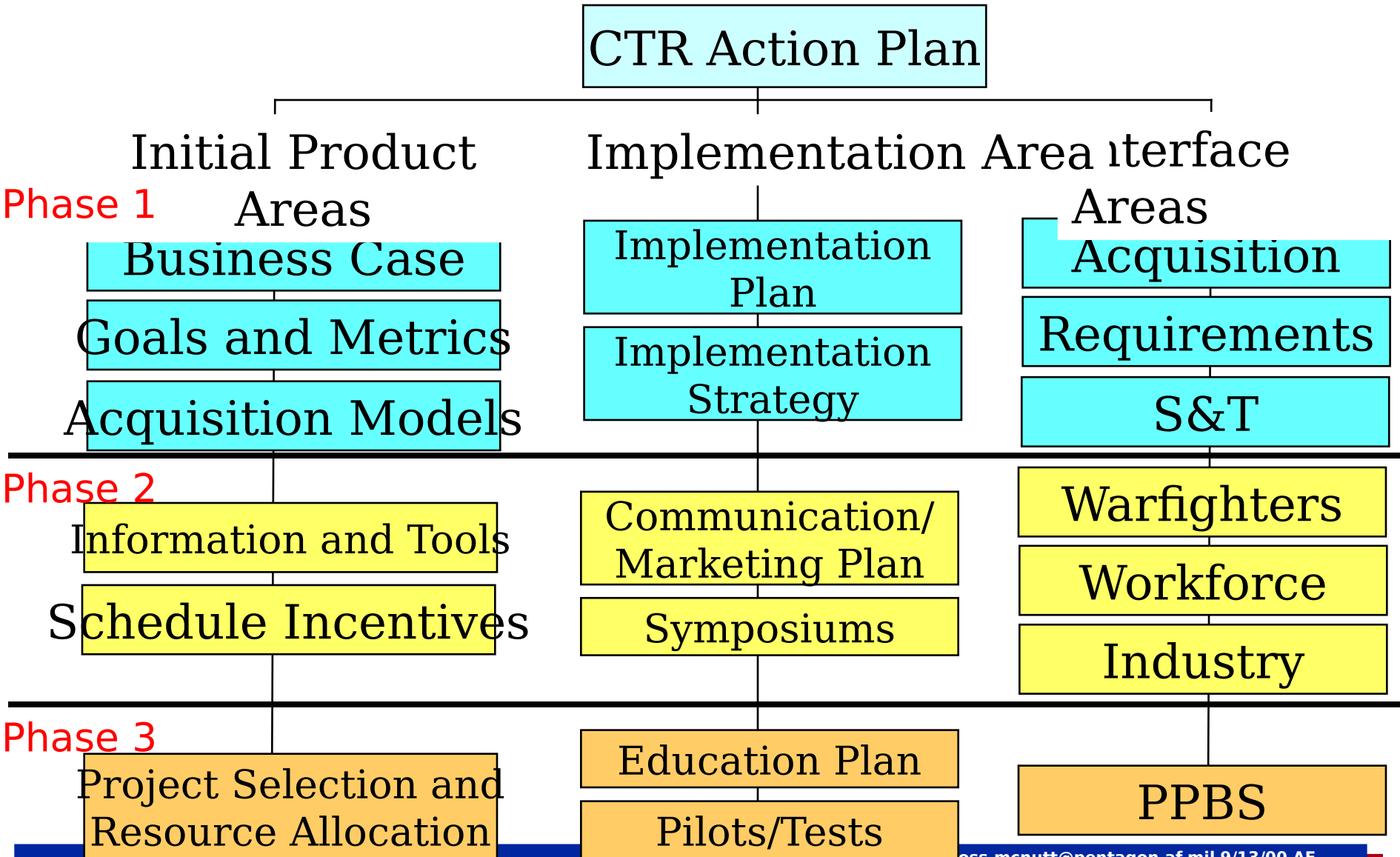
Air Force Cycle Time Reduction Action Plan



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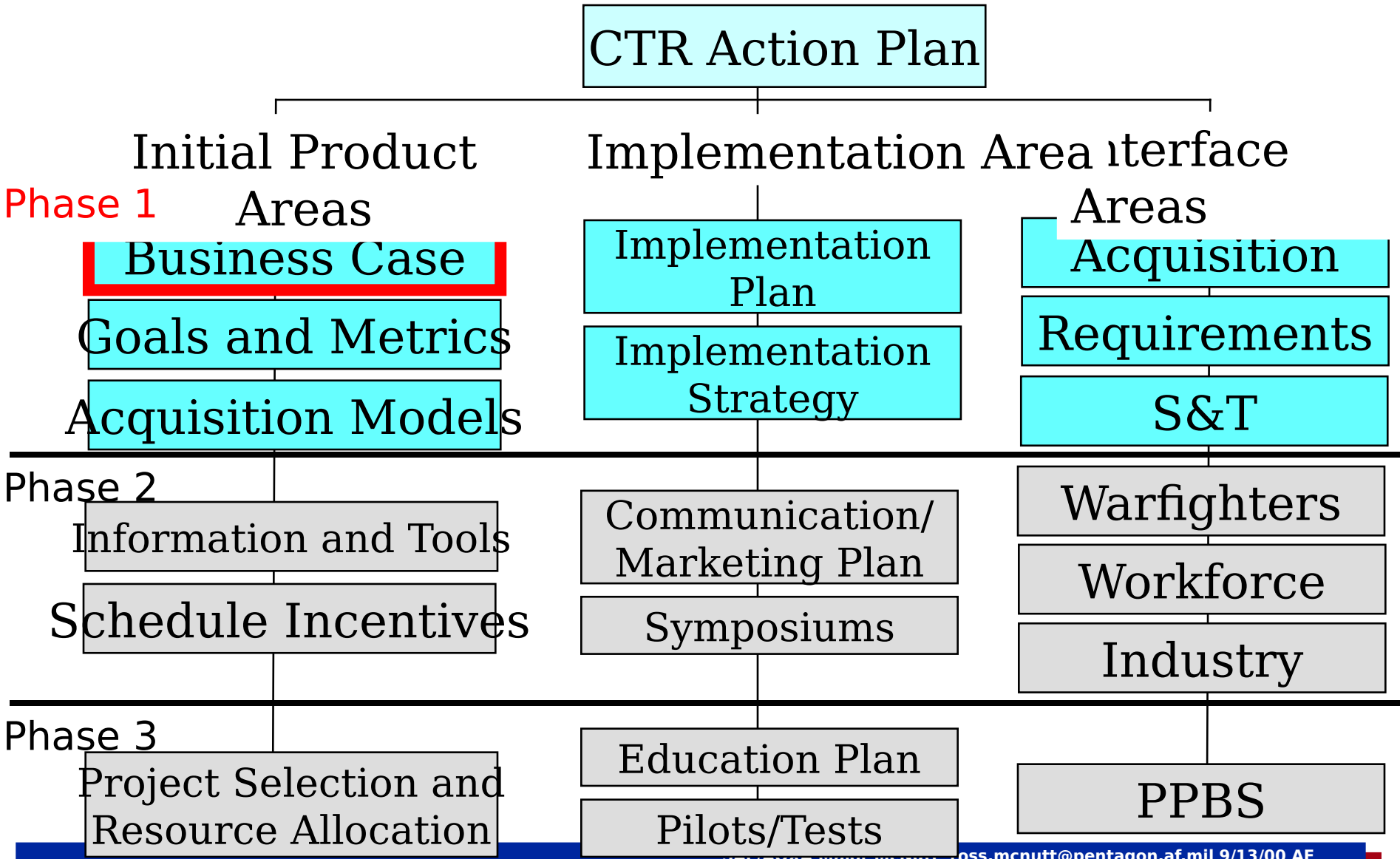
Air Force Cycle Time Reduction Action Plan



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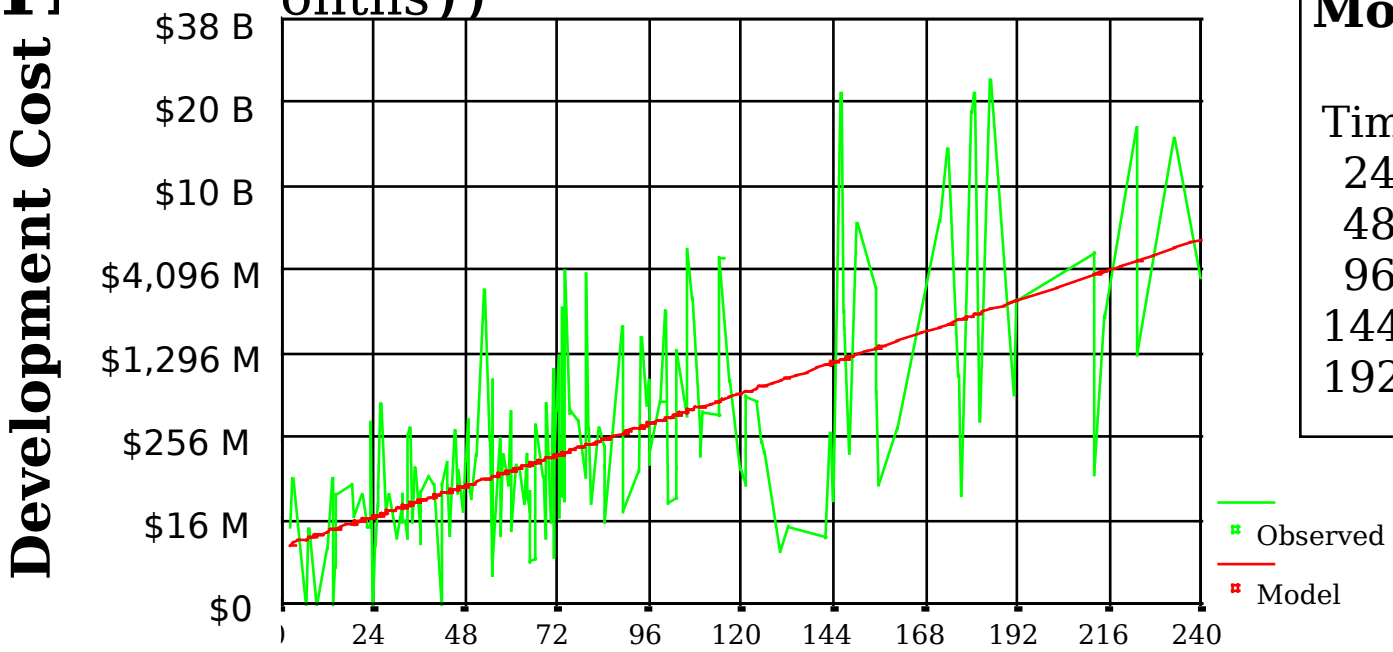
Impacts of Long Development Times

- **Longer to Meet Users Needs**
- **Dated Technology in Newly Fielded Equipment**
- **Increased Development/Production Costs**
- **Increased Logistics Costs**

Impacts of Long Development Times

Increased Development Cost

Dev Cost ($M) ~ (1.36 + 0.03 x **Dev Time**(months))^{4}



Model Predicts

Time	Dev Cost
24	$18.7 M
48	$61.5 M
96	$323.2 M
144	$1.04 B
192	$2.57 B

Based on LAI Survey results from Program Offices, Contractors, and PEMs N=154 Adjusted R^2=0.42

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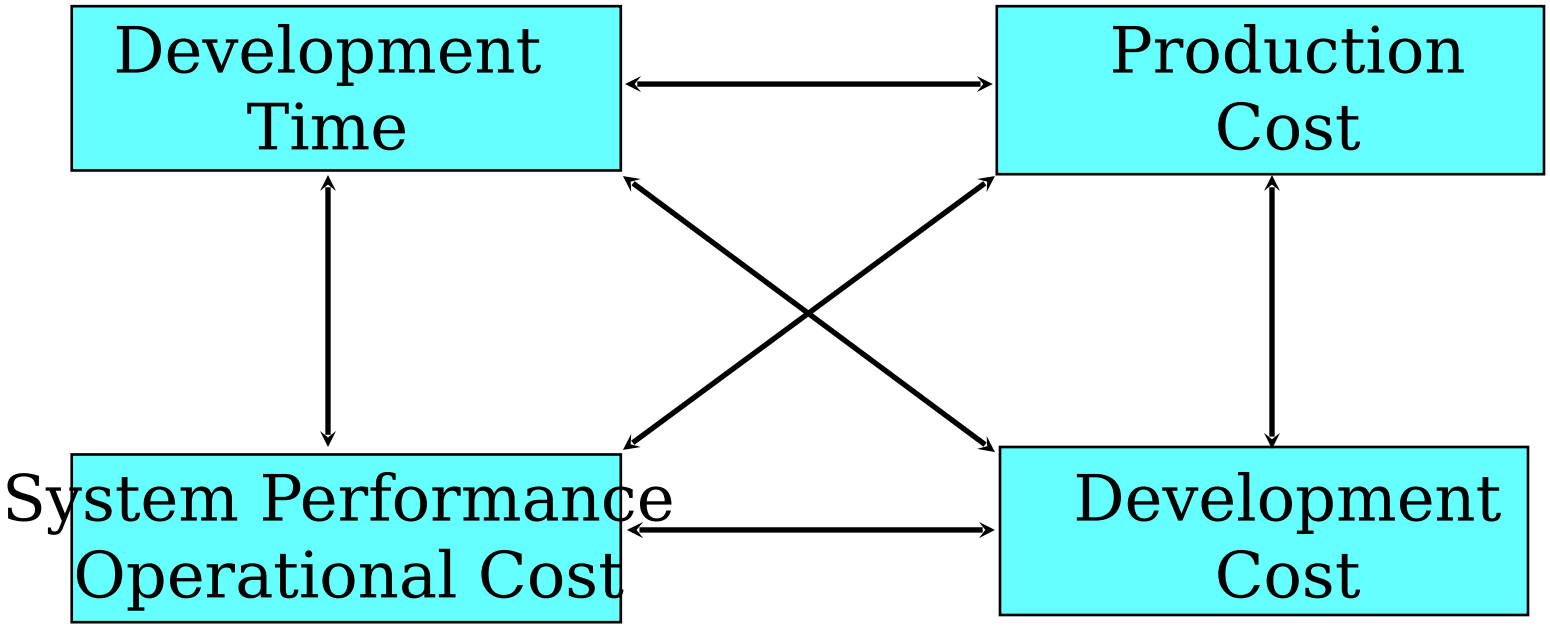
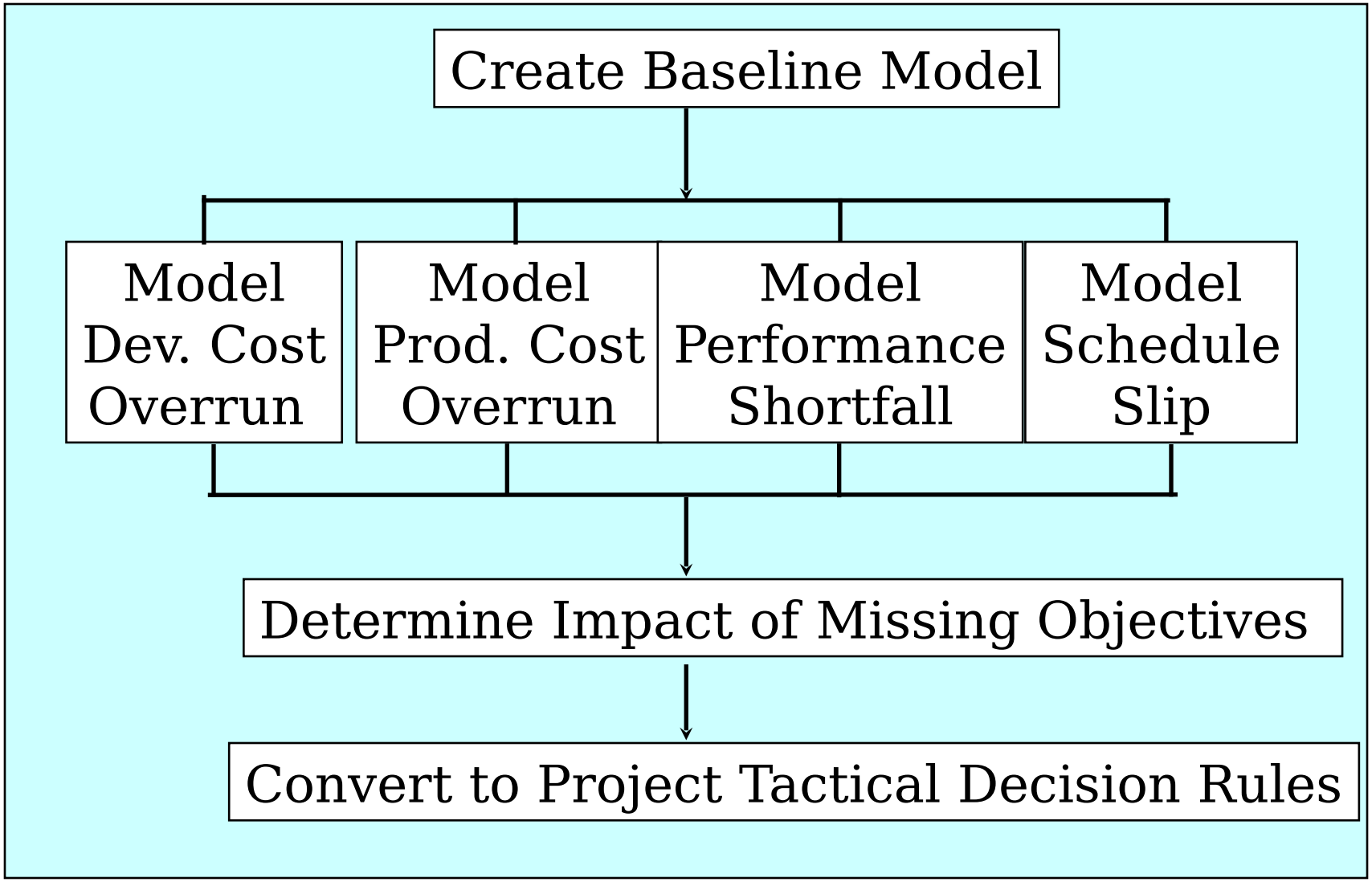
Cost of Delay Analysis



Method provides the necessary informatio make appropriate tradeoffs to maximize v

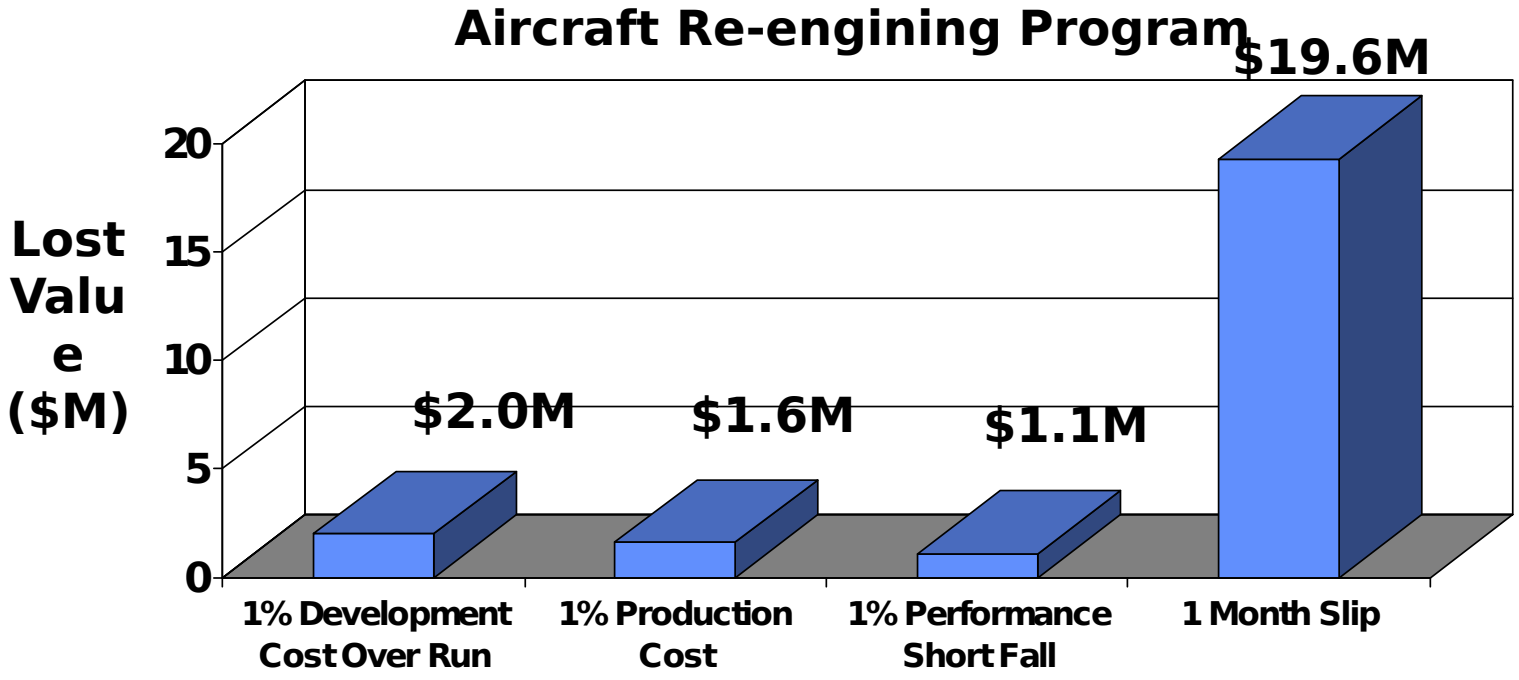
Cost of Delay Analysis



Develop Tactical Decision Rules

Impacts of incremental changes

i.e. 1% increase in development cost,
1% increase in production cost,
1% performance shortfall
1 month slip in schedule



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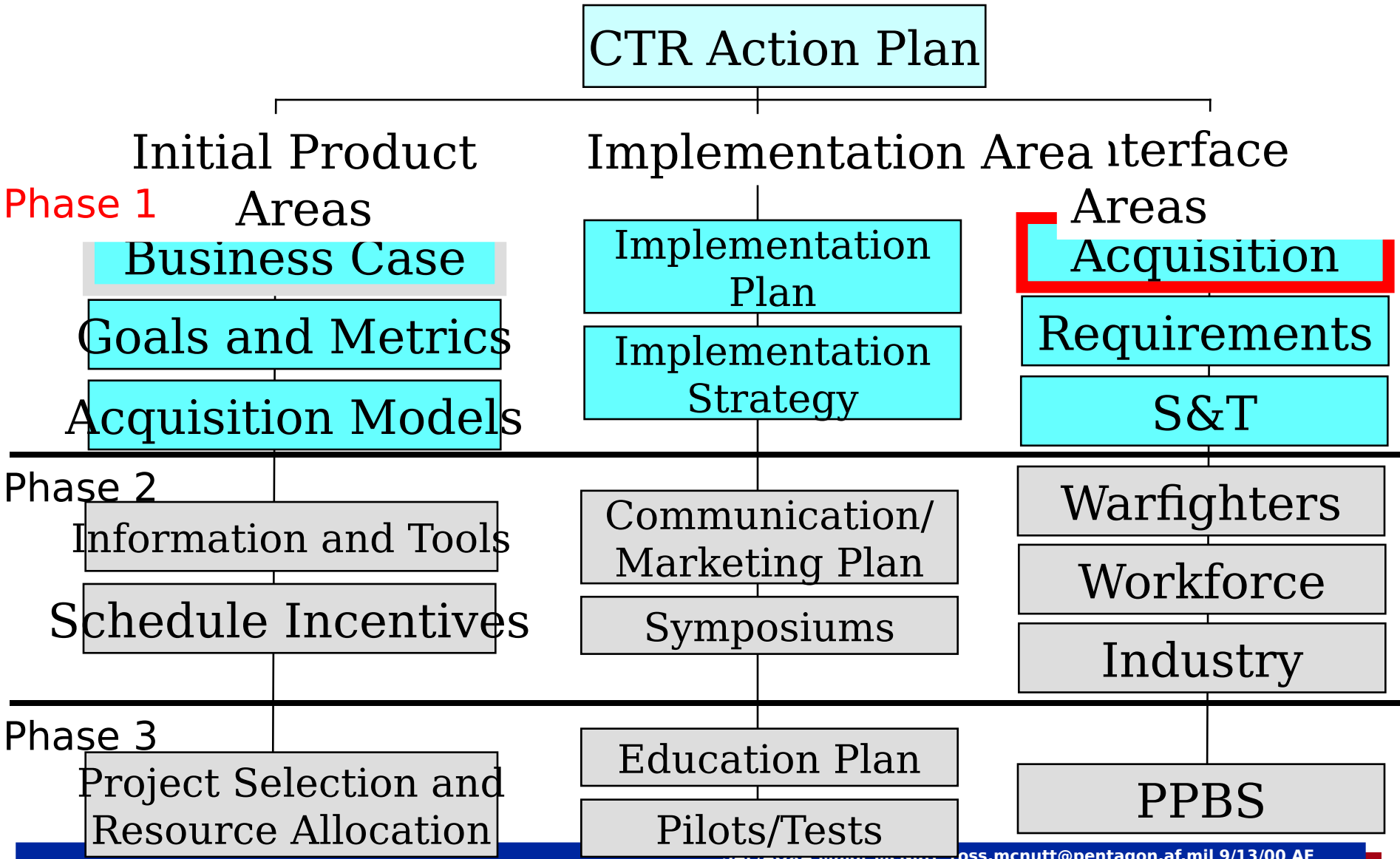
Air Force Cycle Time Reduction Action Plan



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Two Primary AF EA Efforts

Evolutionary Acquisition

Effort led by Evolutionary Acquisition Reinvention Team

Leader: Mr Tom Graves (ASC)

Intended assist the application of evolutionary acquisition strategies for Air Force programs and projects

Goal: Reduced time to develop and field new weapon systems

Status: Drafted Air Force Evolutionary Acquisition Guide to assist program managers in the application of evolutionary acquisition strategies.

Developing Training and Course Material

Spiral Development

Effort led by Electronic Systems Center

Intended to be used for AF C2ISR programs and assets

Goals: Deliver capabilities to warfighter faster

Get acquisition cycle inside technology cycle (18 months)

Status: Being used on Global Air Traffic Management System (GATM), Information Operations Planning System (IOPS), and Expeditionary Force Experiments (EFX). Planned for use on Integrated Command and Control Systems (IC2S)

AFI 63-123 Evolutionary Acquisition for C2 Systems near complete.

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Air Force Position on EA as Preferred Approach

“ While the Air Force concurs with this in principle, we strongly recommend focusing first on the development of an EA doctrine and methodologies prior to adoption of policy advocating it preferred use”

Air Force Comments to Section 912c Study EA Recommendation

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General Officers' Offsite (Feb '99) Spiral Development Offsite Conclusions

- Need to institutionalize spiral development
- Need an overarching model
- Requires cultural change
- Product and process implications
- Capstone requirements --> system capabilities description
- Funding need to be identified

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Determining EA Methodology

Being developed from successful AF experiences

- ***F-16 MSIP, B-1B CMUP, Operational Flight Program***

. . . And the not so successful

- ***Predecessors to Cheyenne Mountain Upgrade***

Learning from Best Commercial Industry Practices

- **Spiral Development**
- **Set-based Design**
- **Lean Product Development**
- **Rapid Prototyping**

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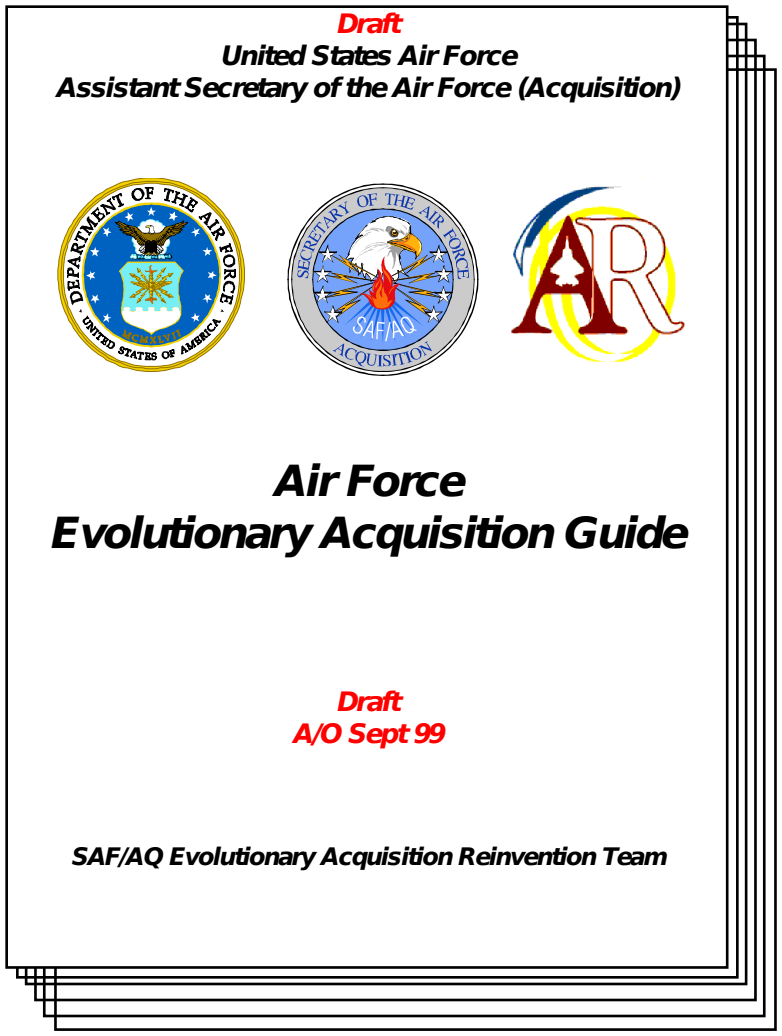
Draft AF Evolutionary Acquisition Guide



Contents:

EA Weapon System Model

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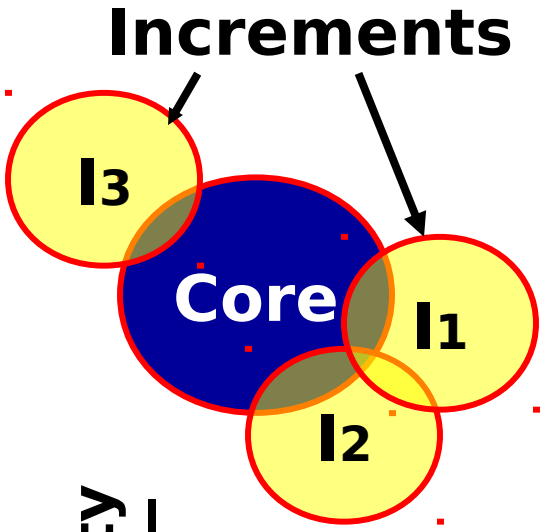
ORD = KPPs + Other Performance Parameters

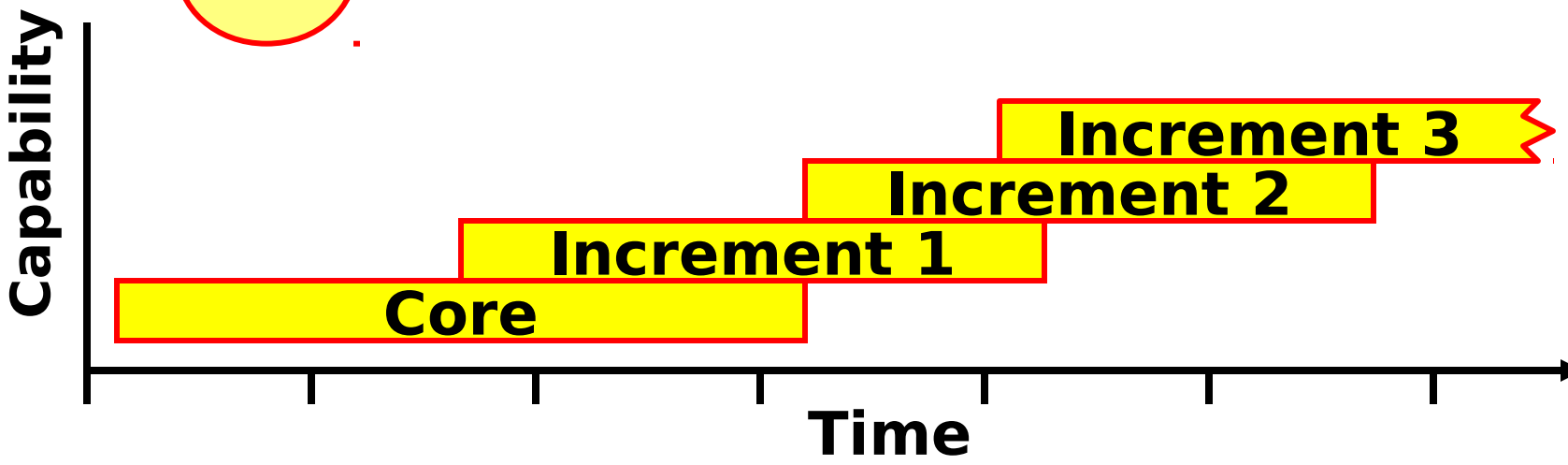


$$Core = KPP_{T1} + KPP_{T2} + \ldots + O_1 + O_2$$

$$I_1 = KPP_{T3} + KPP_{T4} + \ldots + O_3 + O_4 \ldots$$

$$I_2 = KPP_{T5} + KPP_{O1} + \ldots$$

$$I_3 = KPP_{T6} + KPP_{O2} + KPP_{O3} + \ldots$$



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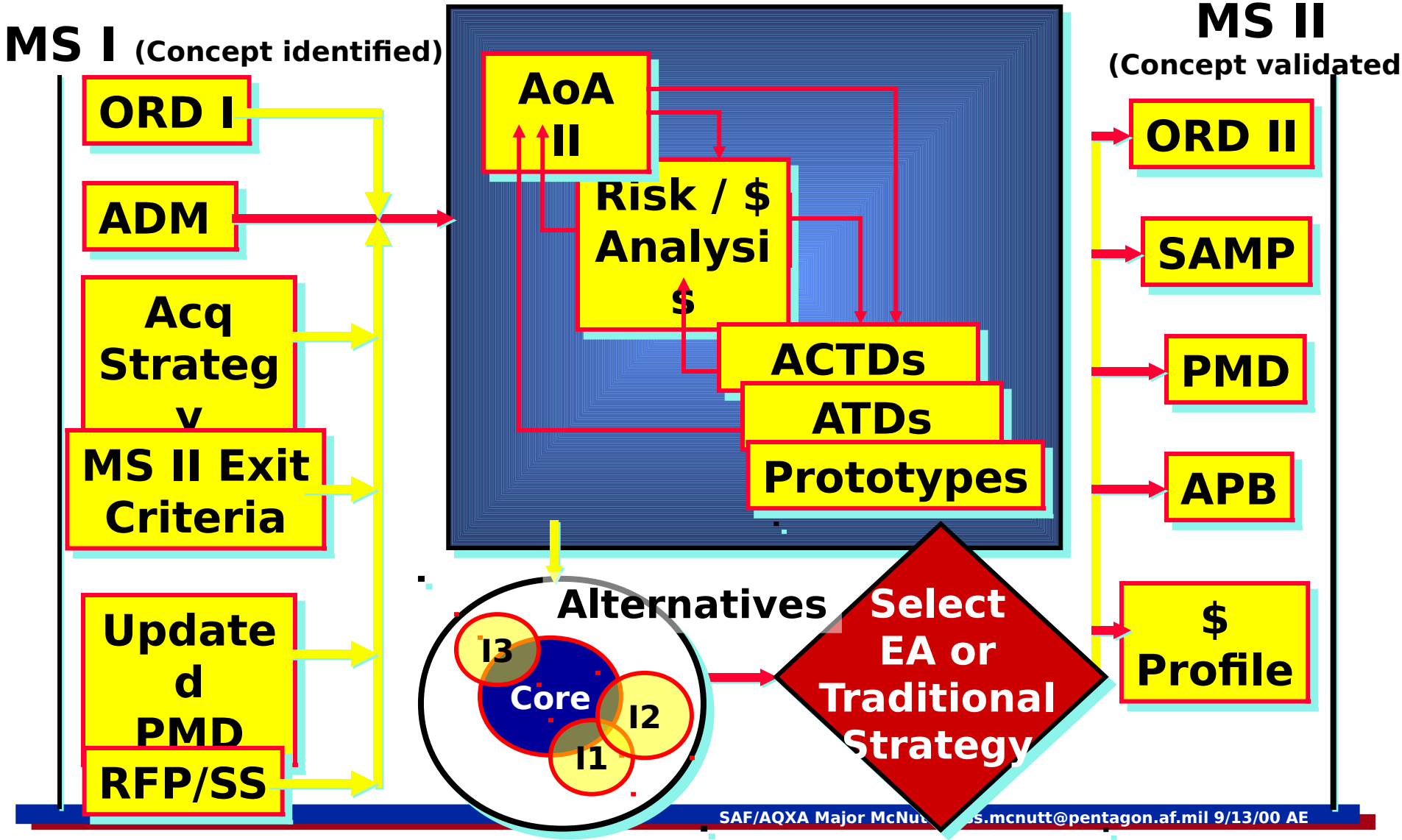
EA Events in Program Definition and Risk Reduction



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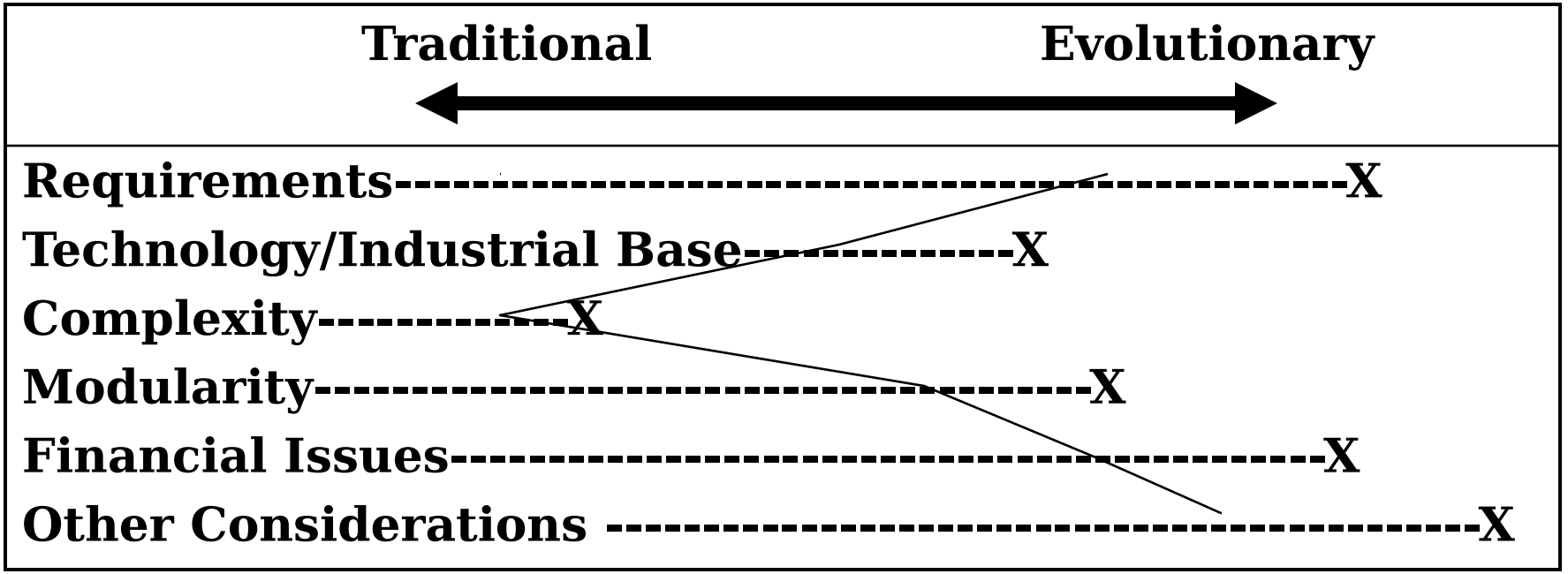
Evolutionary Acquisition Decision Criteria



Requirements - Knowledge and stability of requirements
Technology/Industrial Base - Technology Cycle, Prod Capacity, NDI
Complexity - Functional Interface, Growth architecture, Test Support,
Level of software development, Schedule dependencies
Modularity - Operationally useful pieces, Supportable pieces
Financial Issues - Stability of cost assumptions, quantity, funding, avail ty
Other Considerations - Logistics, Urgency of Need, User Involvement,
Legacy, interfaces agency, Diminishing Manufacturing

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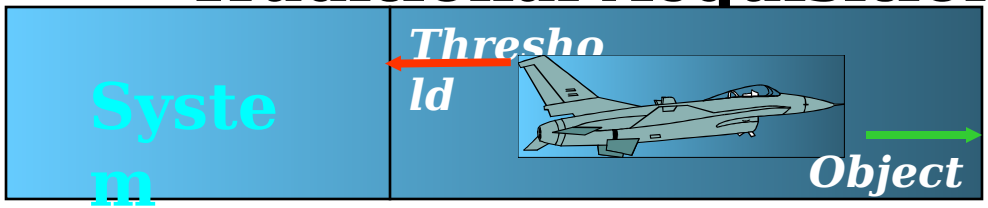
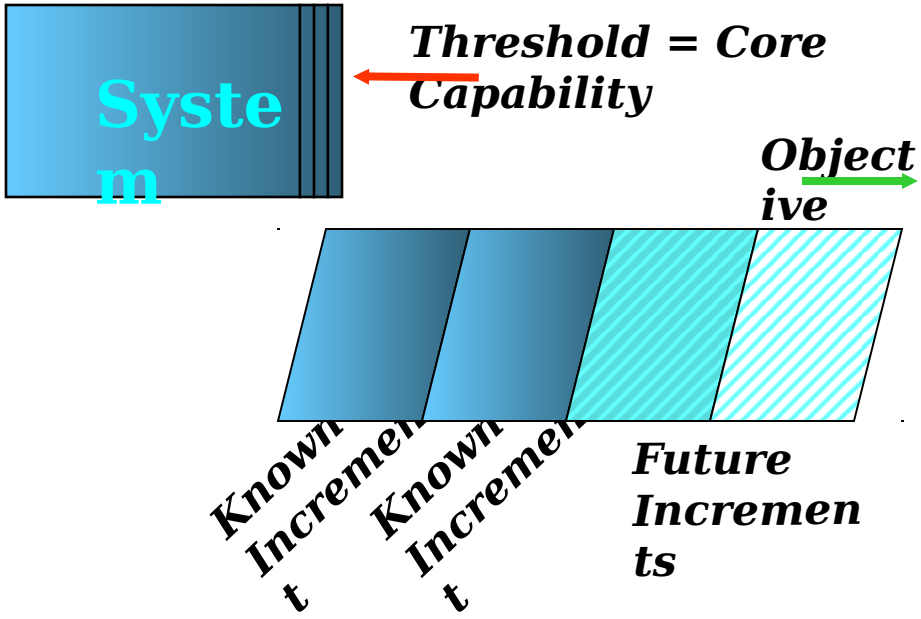
EA Working Concept

Traditional Acquisition



Evolutionary Acquisition



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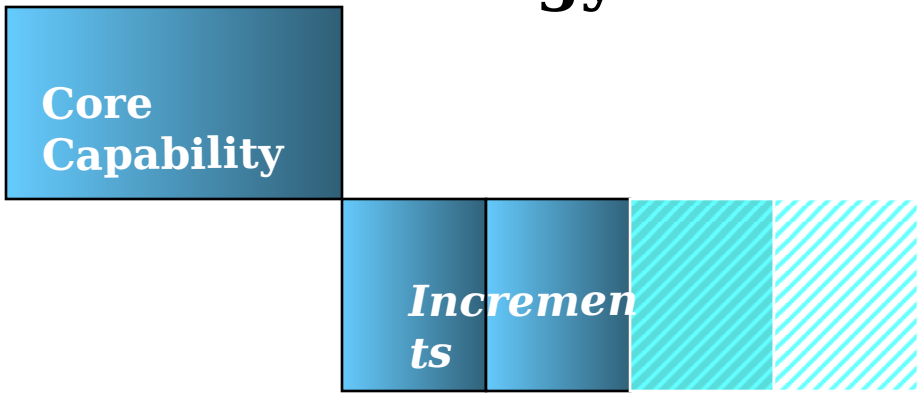
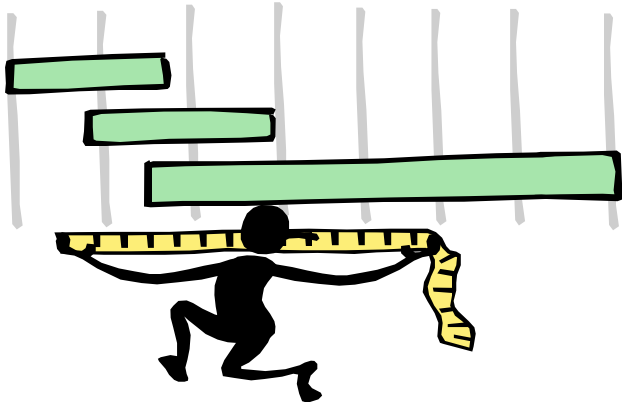
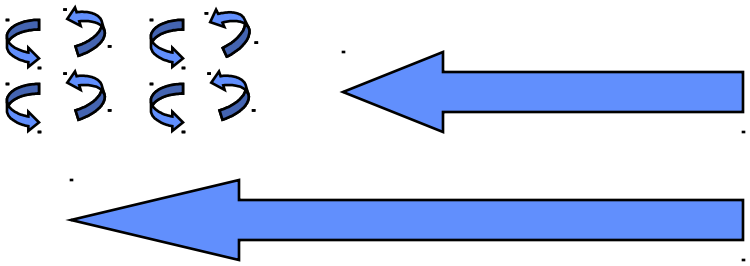
Evolutionary Acquisition vs Spiral Development

Evolutionary Acquisition is a Strategy







Spiral Development is a Process

- <u>Within Increment</u>
- Certain Aspects of the Cor
- Is not a “given” when usin

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Spiral Development Definition

Spiral Development – A method or process for developing a defined set of capabilities **within one increment**, providing opportunity for interaction between the user, tester, and developer communities to refine the requirements, provide continuous feedback and provide the best possible capability **within the increment**. The spiral development process is an iterative set of sub-processes which may include: establishing performance objectives; designing; coding/fabricating/integrating; experimenting; testing; assessing operational utility; making tradeoffs; and delivering. Other sub processes

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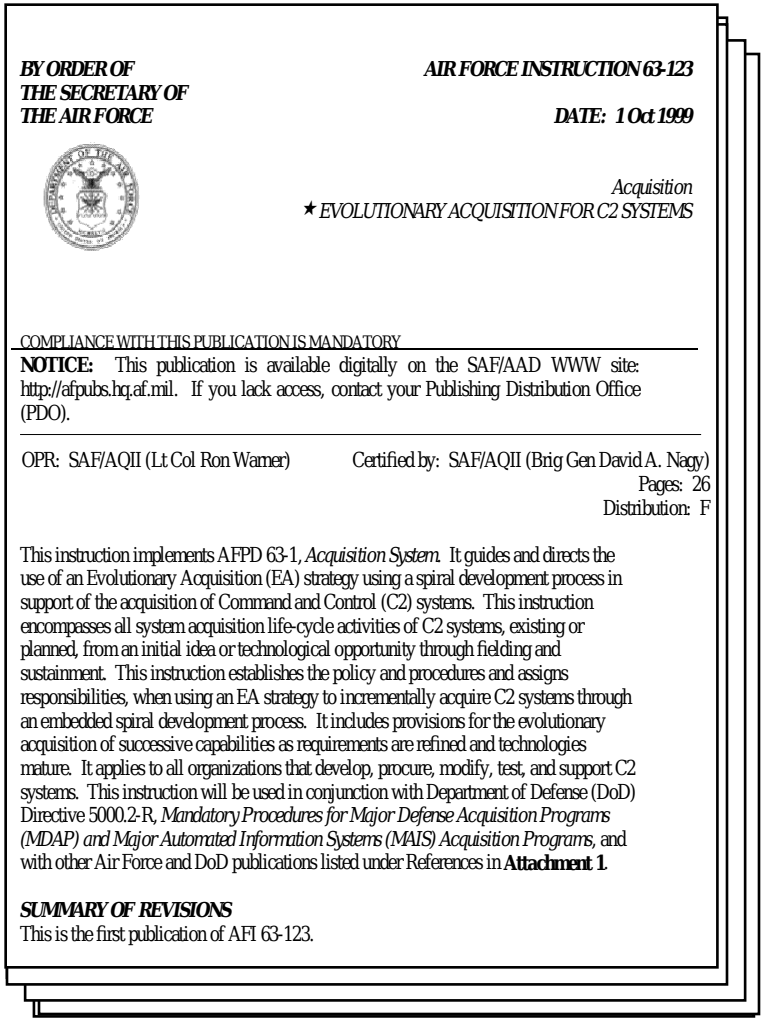
AFI 63-123 Evolutionary Acquisition For C2 Systems



BY ORDER OF THE SECRETARY OF THE AIR FORCE

AIR FORCE INSTRUCTION 63-123

DATE: 1 Oct 1999

Acquisition

★ *EVOLUTIONARY ACQUISITION FOR C2 SYSTEMS*

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

NOTICE: This publication is available digitally on the SAF/AAD WWW site: http://afpubs.hq.af.mil. If you lack access, contact your Publishing Distribution Office (PDO).

OPR: SAF/AQII (Lt Col Ron Warner) Certified by: SAF/AQII (Brig Gen David A. Nagy)
Pages: 26
Distribution: F

This instruction implements AFPD 63-1, *Acquisition System*. It guides and directs the use of an Evolutionary Acquisition (EA) strategy using a spiral development process in support of the acquisition of Command and Control (C2) systems. This instruction encompasses all system acquisition life-cycle activities of C2 systems, existing or planned, from an initial idea or technological opportunity through fielding and sustainment. This instruction establishes the policy and procedures and assigns responsibilities, when using an EA strategy to incrementally acquire C2 systems through an embedded spiral development process. It includes provisions for the evolutionary acquisition of successive capabilities as requirements are refined and technologies mature. It applies to all organizations that develop, procure, modify, test, and support C2 systems. This instruction will be used in conjunction with Department of Defense (DoD) Directive 5000.2-R, *Mandatory Procedures for Major Defense Acquisition Programs (MDAP) and Major Automated Information Systems (MAIS) Acquisition Programs*, and with other Air Force and DoD publications listed under References in **Attachment 1**.

SUMMARY OF REVISIONS

This is the first publication of AFI 63-123.

Contents

- **Scope**
- **Need For Change**
- **Evolutionary Acquisition Strategy**
- **Spiral Development Process**
  - **Spiral Development Process Description**
  - **Documentation**
  - **Requirements management**
  - **Execution of EA and Spiral Development**
  - **Test and Evaluation**
- **Organizational Roles and Responsibilities**

“Spiral Development Reg”

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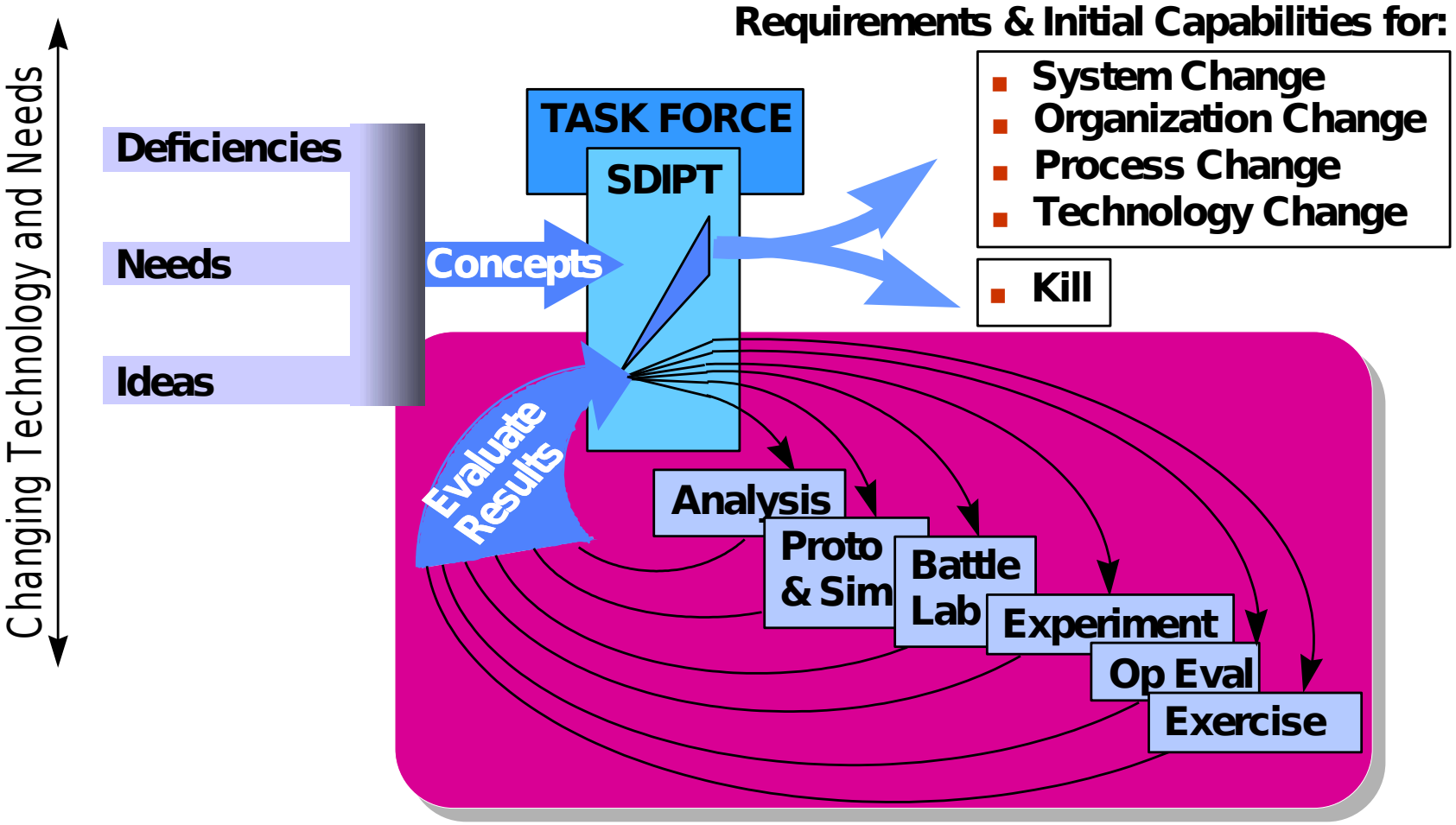
Concept Development



Concept Development. Concept Development matures new concepts, ideas, and technologies into well-defined requirements and initial capabilities.

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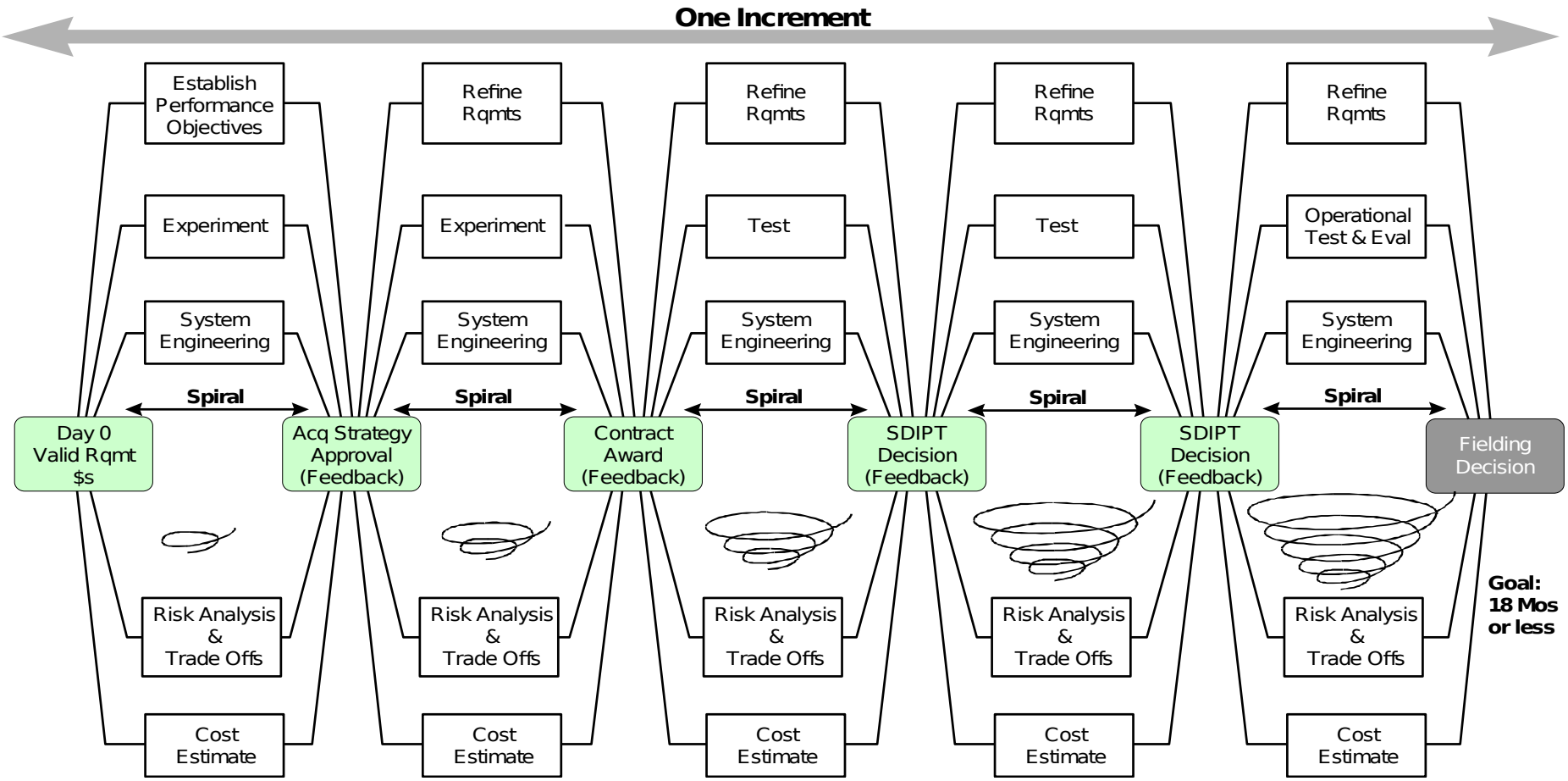
Baseline Development



Begins with the requirements and capabilities developed during Concept Development and refines, integrates, and tests them into a solution ready for fielding

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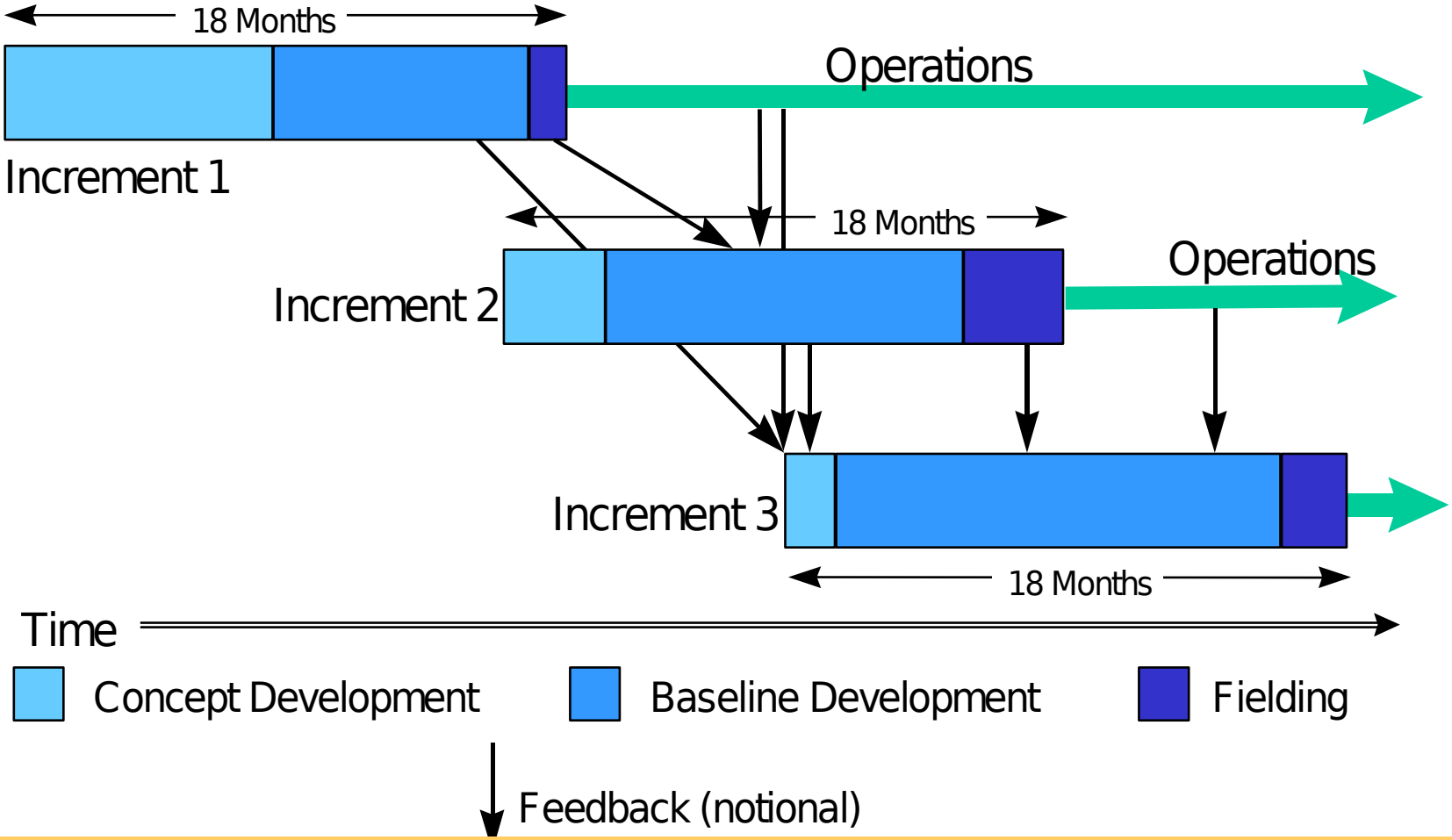
Fielding and Operations



Fielding the C2 subsystem from Baseline Development and then operating and supporting it throughout its remaining life span

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EA Guides and Instructions

Draft

United States Air Force
Assistant Secretary of the Air Force (Acquisition)

Air Force Evolutionary Acquisition Guide

Draft
A/O Sept 99

SAF/AQ Evolutionary Acquisition Reinvention Team

BY ORDER OF THE SECRETARY OF THE AIR FORCE

AIR FORCE INSTRUCTION 63-123

DATE: 1 Oct 1999

Acquisition
★ EVOLUTIONARY ACQUISITION FOR C2 SYSTEMS

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Evolutionary Acquisition Spiral Developme

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How are we doing institutionalizing EA and Spiral Development?

Made good progress, but still have ways to go to

- incorporate into acquisition processes
- institutionalize in our processes,

Good progress with AF Acquisition Community, Contractors, OSD(A&T)

Only have to convince the planning, requirements, programming, costing, MAJCOM, training, sustainment, test, finance, administration, congress, GAO, CBO, AFIA

volutionary Acquisition and Spiral Development Are Only Par
the Steps Necessary to Reduce AF Acquisition Response Tim

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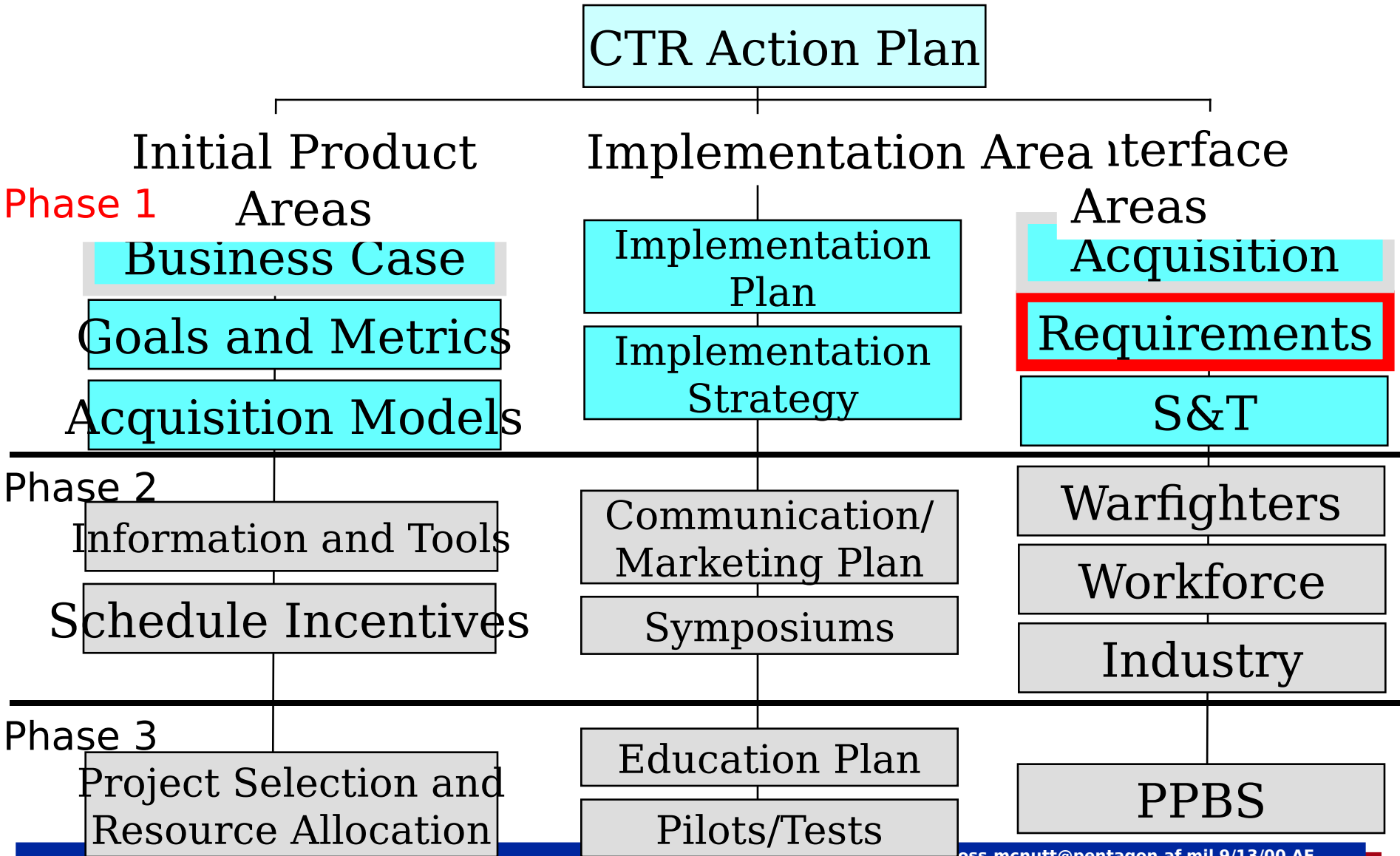
Air Force Cycle Time Reduction Action Plan



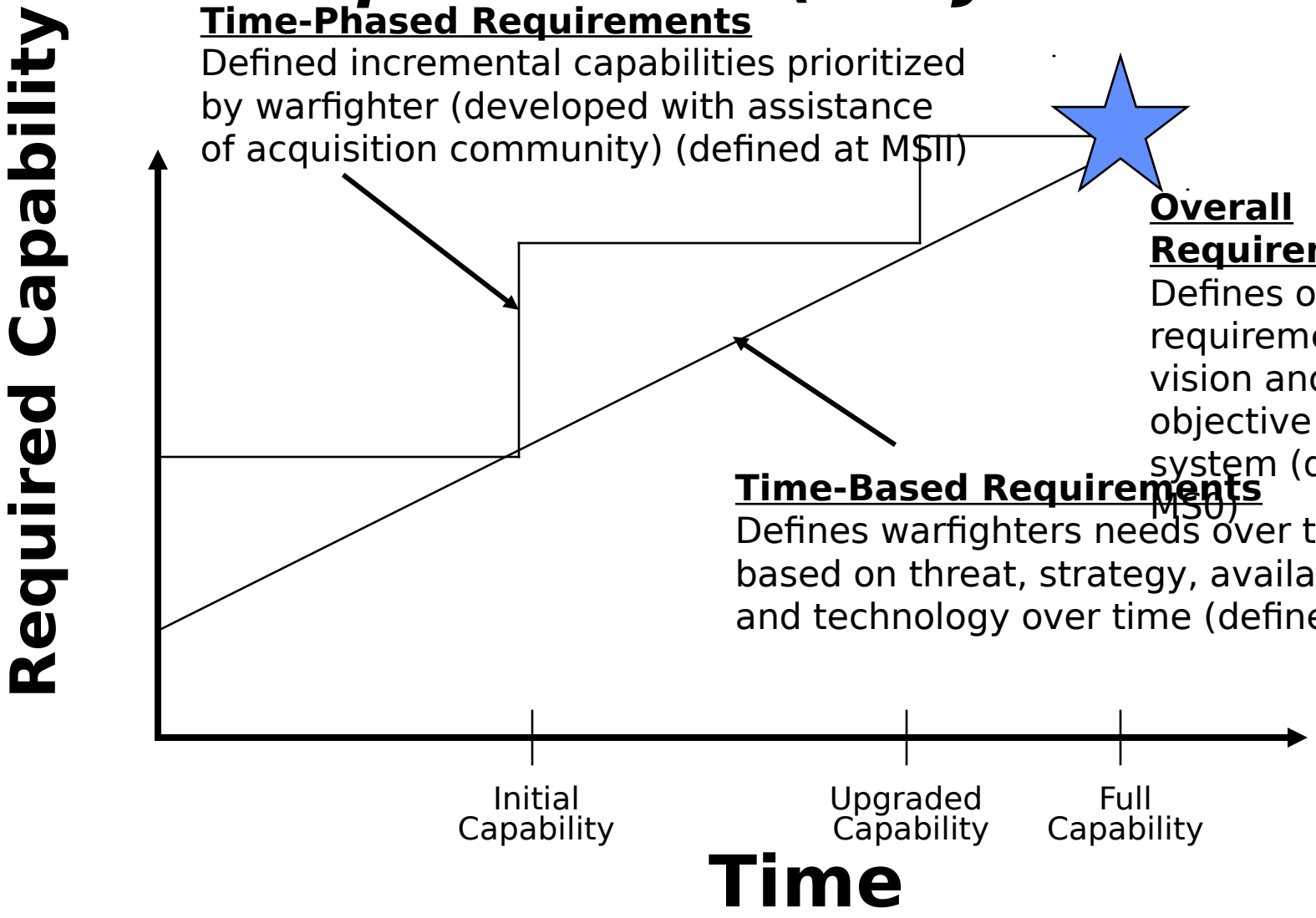
AF Cycle Time Reduction Plans and Actions (Phase I)

Time-Phased and Time-Based Requirements (In CJCSI 3170.01)

Time-Phased Requirements
Defined incremental capabilities prioritized by warfighter (developed with assistance of acquisition community) (defined at MSII)

Overall Requirement
Defines overall requirements, vision and ultimate objective of desired system (defined at MS0)

Time-Based Requirements
Defines warfighters needs over time based on threat, strategy, available capabili and technology over time (defined at MSI)



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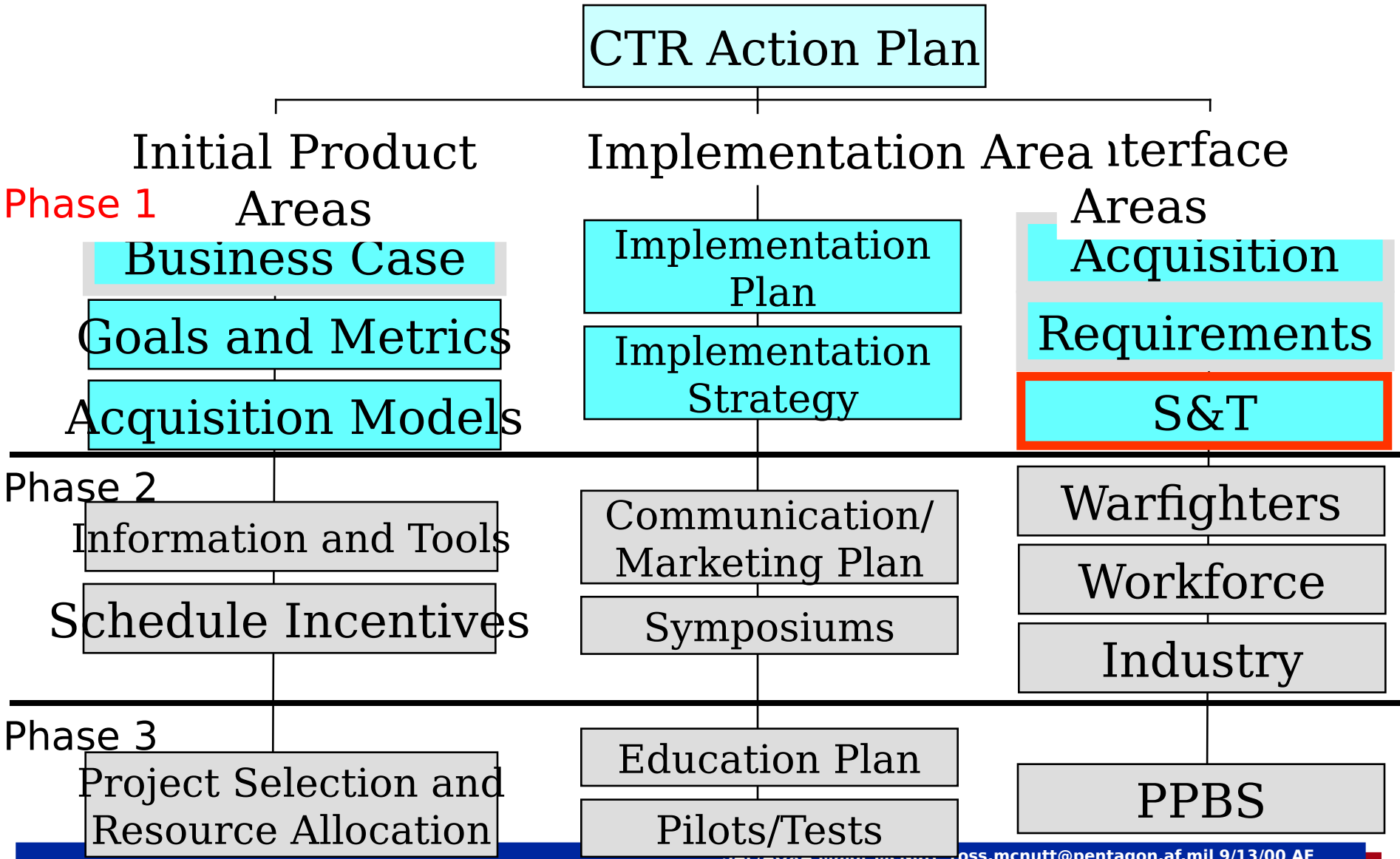
Air Force Cycle Time Reduction Action Plan



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Decision/Initiation Time

Transition Planning

Innovation Transition Planning

- **Many current experimentation and innovation efforts lack sufficient transition planning**
- **Significant transition planning must occur to support transition decisions and initiation of an acquisition project**

- **AC2ISRC is "Lead User" in transition planning efforts**
  - **Warfighter experiments - Battlelab initiatives**
  - **ATDs - Spiral development efforts**
  - **ACTDs - POM Building**

Necessary to make informed decisions on potential projects - speeds

Fundamental Difference between "Current" and "Proposed" Models

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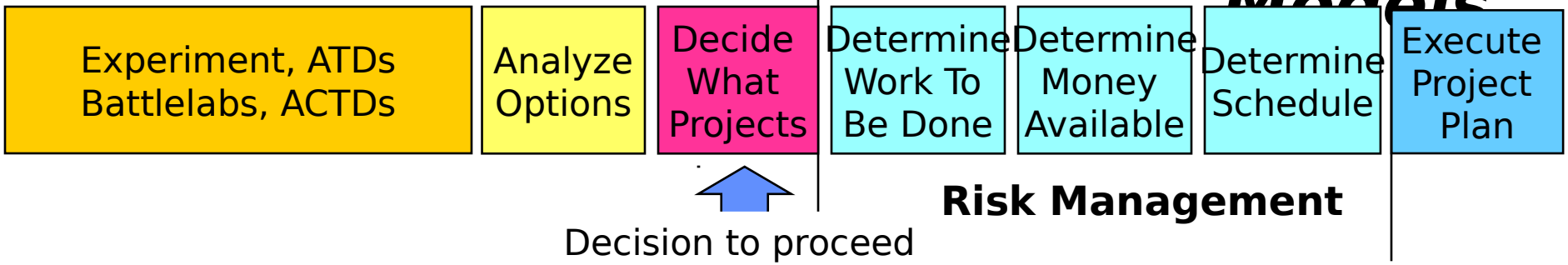
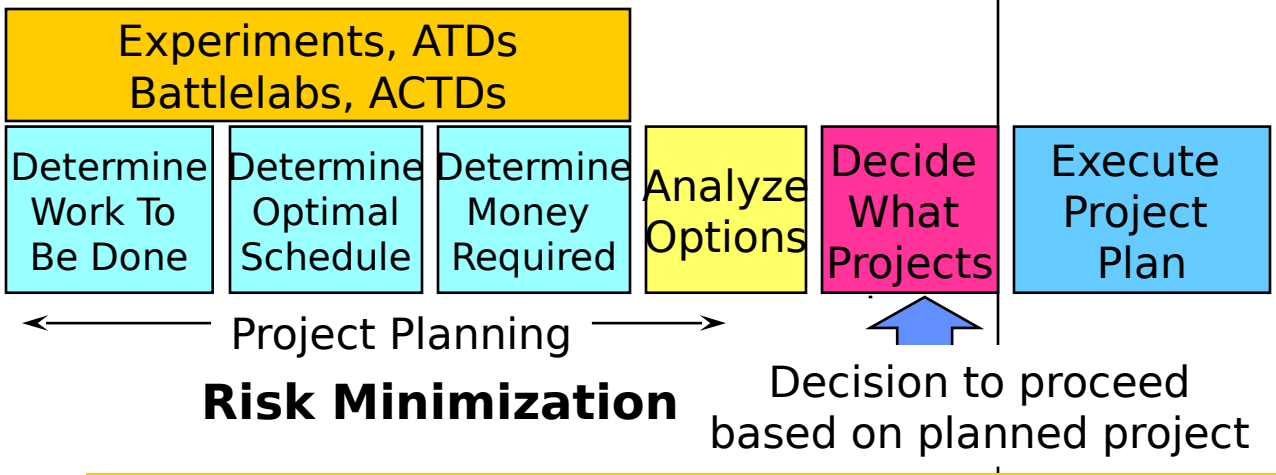
Curren



Proposed



Projects must be fully planned prior to dec

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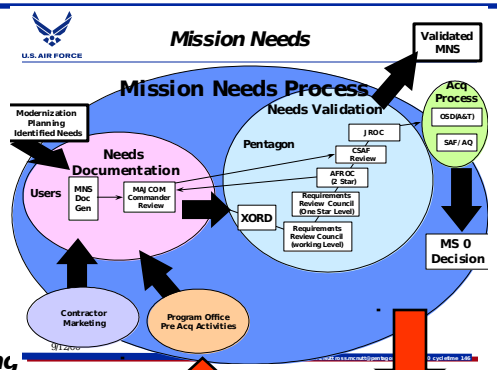
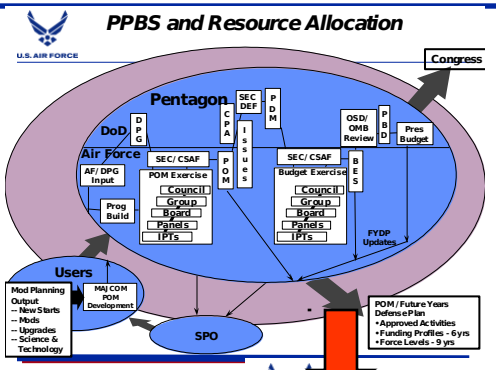
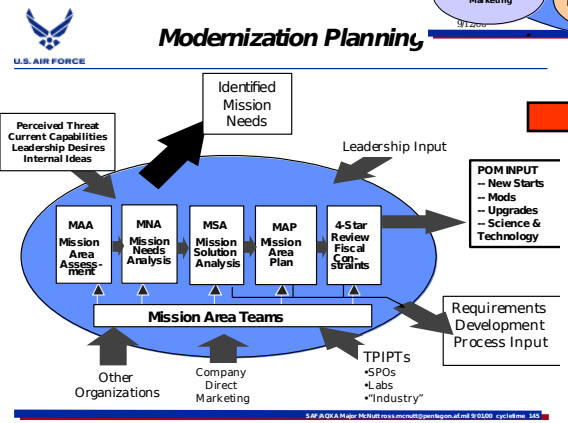
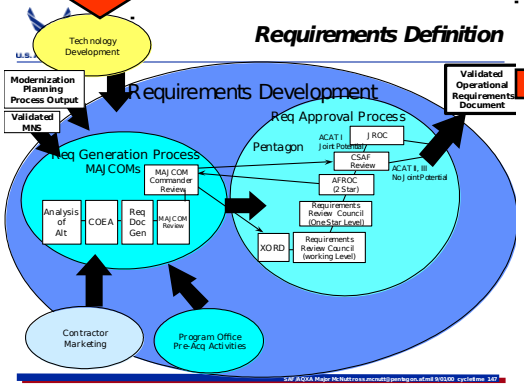
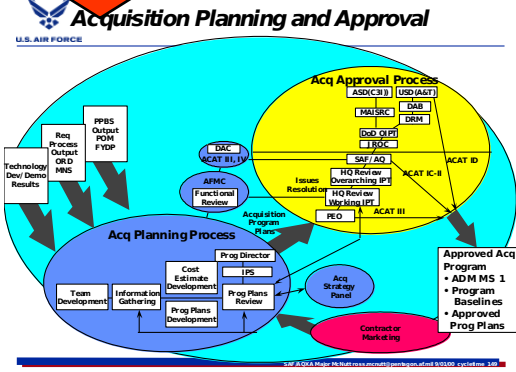
Current Formal AF Project Initiation Process









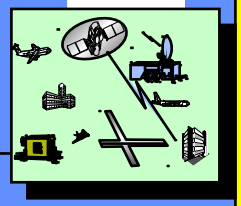


What we observed:

- **24 separate reviews within the Air Force Pentagon alone "**
- **Process takes 2-5 years to complete**
- **Lots of people (1600 for requirements alone < 200/year)**
- **Leadership frustrated with process - Direct shorter process**

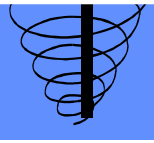
Proposed AF Warfighter Rapid Acquisition Process (WRAP)

(as currently defined, 5 July 00)



JEFX

Spiral Developmen



ATD/ACTDs

Battle Labs

Novel Ideas

MAJCOM Selection Process

Complete Project Proposal
CONOPS, Requirements,
Acquisition Plan,
Future Funding Commitment

Project Planning

MAJCOM Nominatio n

Commanders nominations
Complete Project Proposal
Future Funding Commitment if Selected

XO Conops/Reqts Readiness Review & Prioritization

CONOPS Review
Requirements Cert/Validation
Prioritization

Competitive selection between projects
Pass/Fail criteria

AQ Acquisition Readiness and Cost Review

Acquisition Plan Approval
Contracting Strategy Approval
Cost Estimates Validation
Risk Assessments

XP/Corporate Future Funding Review and Commitment

Affordability Determination
POM Year Commitments
Recommendation to Leaders

Integrated HQ Review

Rapid Response Council

AF LDRSHP Selection/Appr

OSD & Cong Notification

Implemen t

Timeline

Cumulative Days

0 15 30 45 60

Competitive Selection Between Competing Projects Involved the Critical Organizations in Their Areas of

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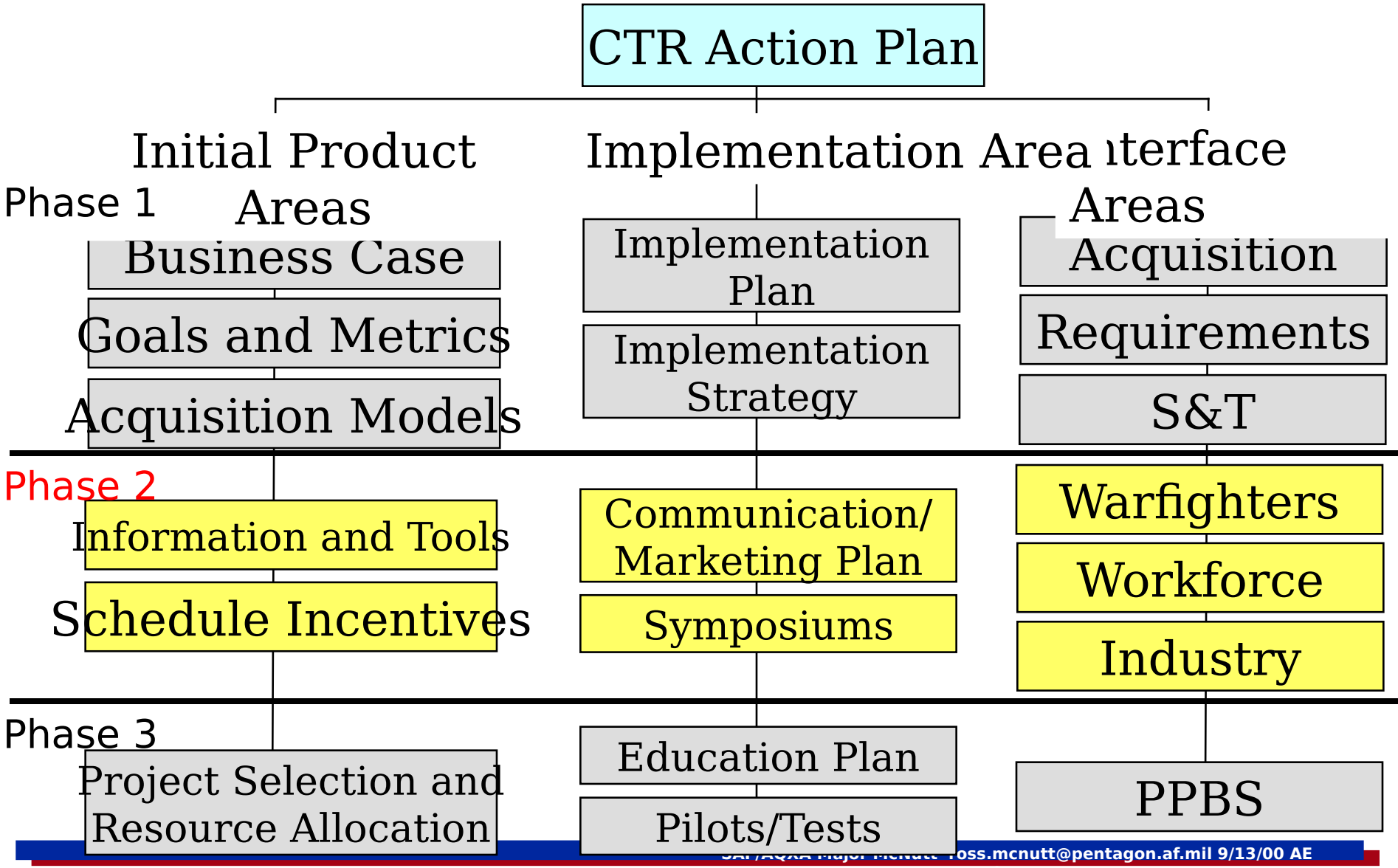
Air Force Cycle Time Reduction Action Plan



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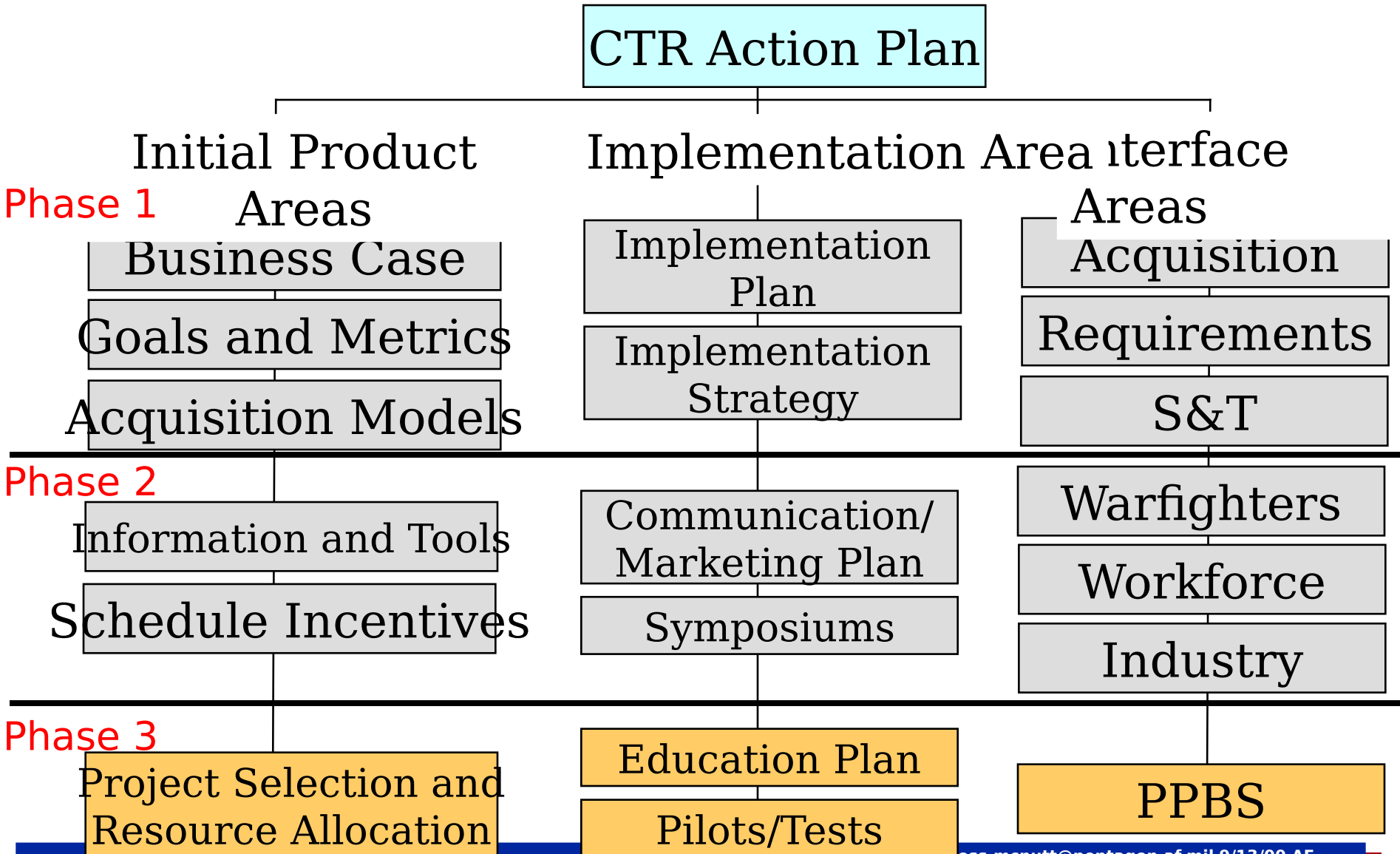
Air Force Cycle Time Reduction Action Plan



Classic Signs of Poor Portfolio Management

- **Large number of projects in development process**
- **Significant resource contention (people, $, equipment)**
- **Projects take much longer then necessary**
- **Many late or delayed projects**
- **Many projects down-scoped late in development**
- **Many cancelled projects**
- **Under performing products in market**
- **Many projects not meeting sales (production goals cut)**
- **Lack of personal accountability for project success**
- **Products not aligned with strategic direction of company**

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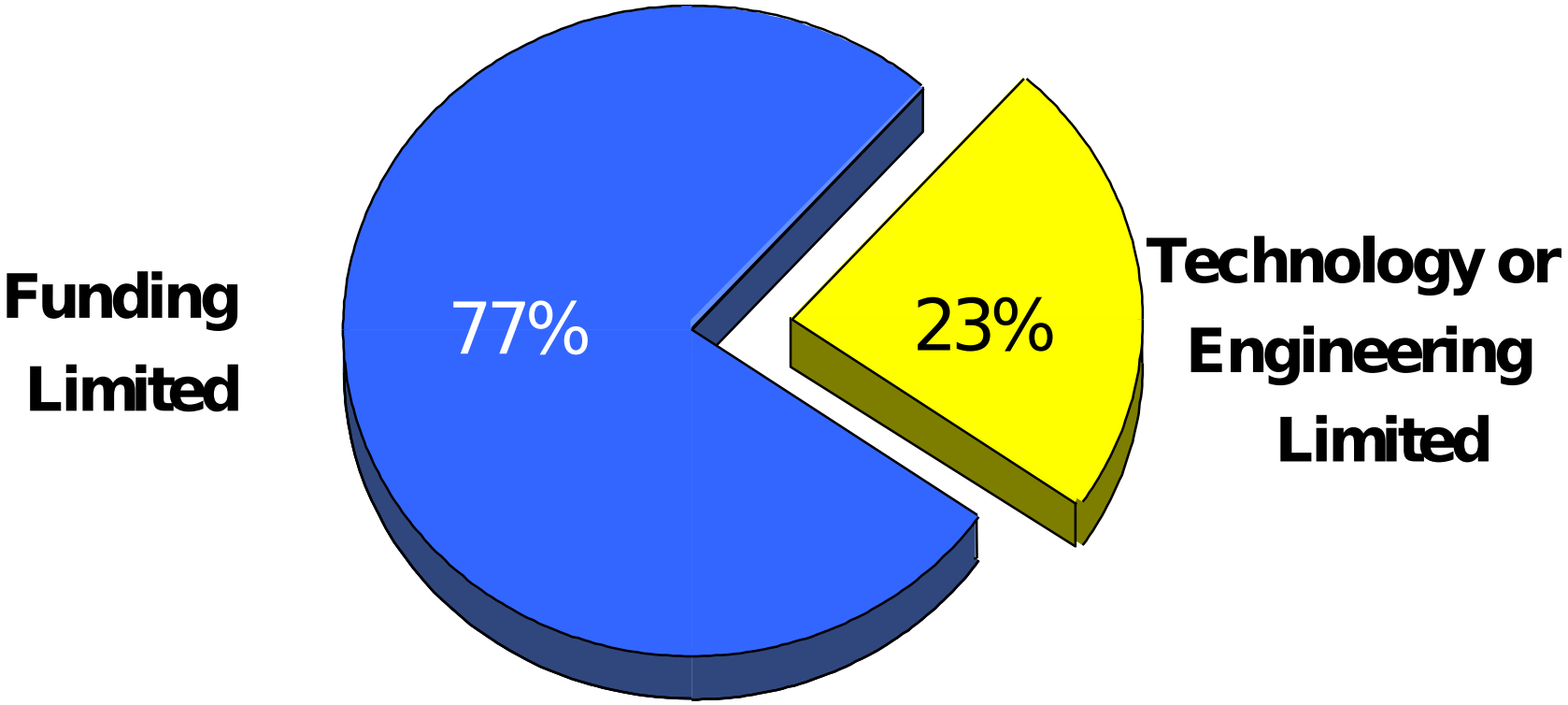
Schedule Limitations: Funding Limited Vs Technology and Engineering Limited



Percent of Respondents Reporting the Limiting Factor for Their Project's Schedule as Funding or Technology and Engineering (Pentagon Survey; Number of Projects = 61)

Recommendation 4

Mitigate Funding-Based Schedule Constraints

The allocation of resources across the DoD portfolio of projects should allow for potential cost savings through cycle time reduction in product development

Recommended Steps:

4.1 Require All Projects That are Initiated Be Fully Funded Based on Development Related Requirements

4.2 Establish an Effective Project Screening Process

4.3 Limit the Number of Projects in Each Phase of Development

4.4 Clear the Log Jam of Current Projects

4.5 Ensure Necessary Funds are Available to Accelerate Projects as Opportunities Arise

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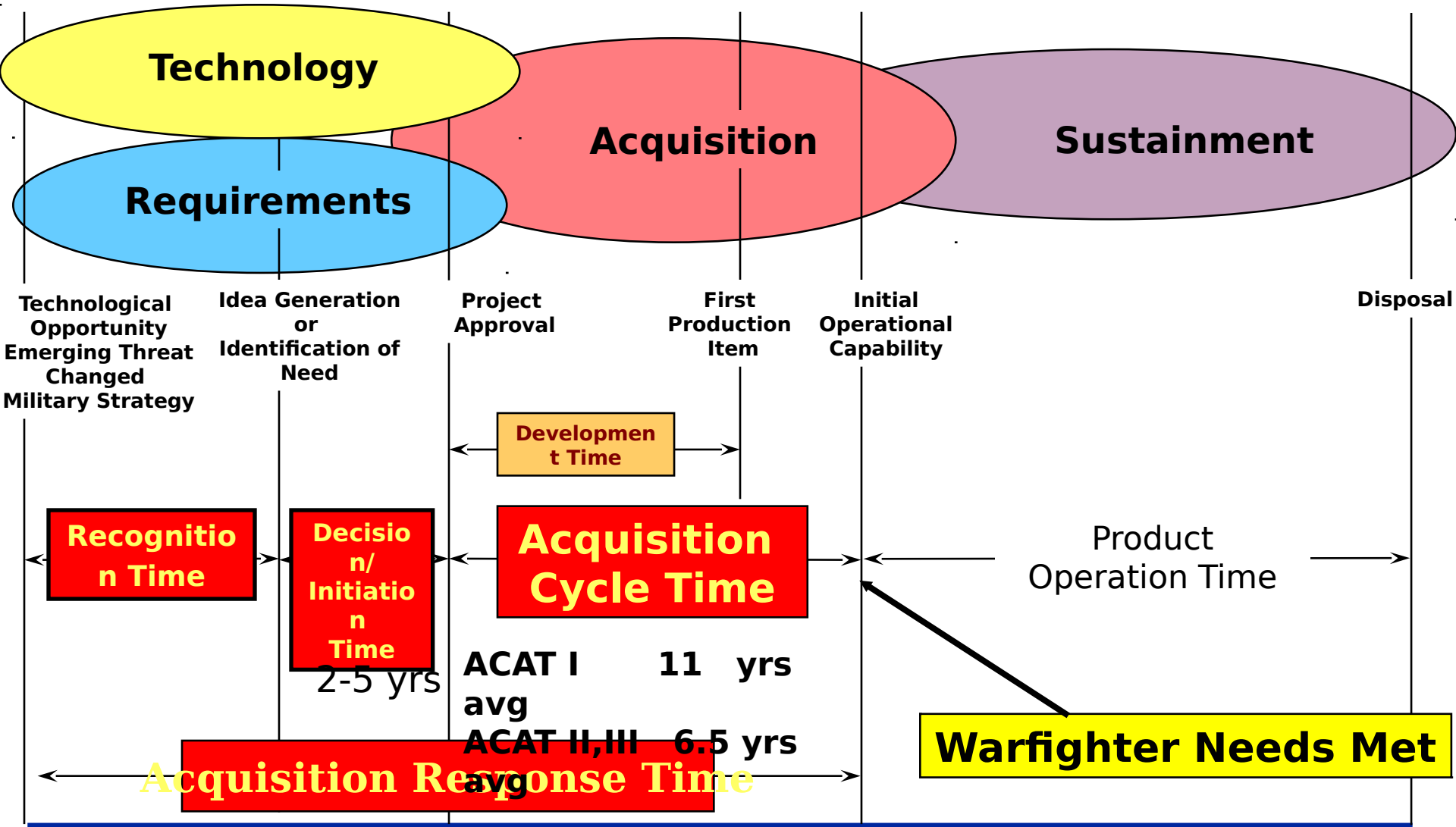
Acquisition Response Time



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Summary

- **Focus on reducing our long acquisition response times**
- **Institutionalizing Evolutionary Acquisition and Spiral Development -- but only part of the solution**
- **Must address in Recognition, Decision Initiation, and Acquisition Phases**
- **Action plan being executed**
- **Actions cross all organizations**

All the actions are necessary to make our acquisition process - Fast and Smart

“and miles to go before I sleep.”

Robert Frost